

Impact of E-Learning and Information and Communication Technology (ICT) on Learning in Taiz University

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Abstract

This paper has explored the critical e-learning and ICT factors for learning by means of the techniques of Structural Equation Modelling (SEM). The research with 200 participants was carried out in three phases: field study, pilot survey and main survey. The results indicate that e-learning and ICT significantly affects learning. This study offers a comprehensive research model for further examination in universities in Yemen and provides the learning characteristics with practical suggestions.

This study tends to identify the e-learning and ICT diffusion in universities by English language teaching students (pre-service teachers).

A model, which explained the effect of e-learning and ICT on learning, was established and tested. Using AMOS 5.0 (Analysis of Moment Structures) program, it explained 77% of learning, with good model fit. The subjects made use of the ICT and e-learning materials in full time and multi-tasks such as searching, browsing, downloading (audio and video), copying text, listening and watching audio & video, reading, writing, extracting and abstracting information. This study encourages pre-service teachers (learners) to use chatting for more discussions in the category of online collaborative and then report their information in different styles through assignments, projects on Wide Web World, or face-to-face in the classroom meeting.

Keywords

E-Learning; ICT; Structural Equation Modelling; Learning

Introduction

The most important factor that determines educational innovation in general is teachers as they use the ICT investments for educational development. Because technology does not have an educational value in itself, it becomes important when teachers use it in learning-teaching process (Tezci, 2009).

Therefore, an important aspect in successfully implementing ICT in education is user acceptance, which is influenced by users' attitudes toward computers (Usun, 2009).

Most of the researchers focus on in-service teachers, only few of them focus on pre-service teachers, especially their attitude toward ICT. Teo (2009) have found that pre-service teachers' attitude toward ICT are positive in Singapore and Malaysia. Birgin (2010) discussed that computer and internet use profiles of first year pre-service teachers' in terms of gender, and concluded that females are more likely to own a computer, whereas males are more experienced in using computers and that they used computers more frequently. It was found that computer attitudes had been not changed according to gender, though a significant difference has been found in terms of computer competency favouring males.

Kizilkaya and Usluel (2007) indicated that Information and Communication Technologies (ICT) contributes to learning and gets ability for a top level thinking and, it has also been forwarded during the learning process to help the teacher to guide its teaching. Also, similar results in relation to technology education are of importance. To be able to form a learning choice, teachers must be aware of the potential of ICT, and then choose adaptable methods according to the learner needs, to be able to handle troubleshooting in technology support learning and practicing is of importance.

For the development in the teachers' occupation, the aim of knowledge and communication technologies uses is not only to provide the latest technology equipment. The main aim is to support the teacher

needs and to provide the necessary technological use (Tezel, L. 2007). The main target of professional development program is aimed for the teachers' behaviour to change according to the new information guide. However, the first step in professional development is to search whether there is or isn't a positive attitude towards technology for teachers. The next step of professional development is whether the teachers have sufficient knowledge about technology and if there are any developments within this program (Barnett, 2003).

As Barnett (2003) expressed that although teachers' attitudes towards technology are positive, the first step should be that computer technology must be used and there should be an increase in success. Teacher candidates who will practice their duties as teachers, their basic computer skills and attitudes towards computer and technology should be determined as it is an important factor for integration of information and communication technology education.

Although there have been other studies that have put forward the assertion that it is not sufficient enough for teachers to only have basic computer skills and information on integration of information and communication technology education (Kizilkaya & Koçak Usluel, 2007).

Education institutions are expected to provide pre-service teachers with adequate knowledge and skills to utilize information technology as an effective tool in their teaching practices. Therefore, instructors are encouraged to integrate technology into their teaching process to facilitate the integration of technology into the learning process. Pre-service teachers are also expected to possess the positive attitudes towards the usage of computer and Internet (Wong & Hanafi, 2007).

ICT gives available solutions to currently educational and research problems. In developing countries, the main problem in educational systems is related to the increasing quantity of services while in developed nations the main focus is on quality. Universities and scientific institutions across the globe try to improve both the quantity and quality of education using modern technology (Chizari and et.al, 2003).

E-learning and Information and communication technology offer access to learning to students and people in need (e.g. out-of-school young people and children with disabilities) and improve the quality of

teaching and learning outcomes.

Many countries have recommendations for ICT for future and practicing teachers' skills. In over half of all European countries, ICT has become an important part of the curriculum for the initial training of teachers for primary and secondary education. However, the recommendations on the subject of ICT practice and training are often general and its organization, content and the amount of time to be devoted to it are the prerogative of individual teacher training institutions (Balcon, 2003).

Case studies have indicated the importance of ICT in teacher education programs. The Asia-Pacific region showed that pre-service-teachers and educational institutions demonstrate a considerable average of challenges, including basic issues such as lack of power, Internet access and telephone, which acquire the effective use of ICT in teaching and learning. In Japan in 1989, a new National Curriculum called "Course of Study" was issued. In this curriculum, elements such as pupils' competence and familiarity with IT, their ability to select appropriate IT applications for various tasks, and their understanding of its implications for society and the individual have been covered. Those school based changes required complementary changes in teacher education. From the 1988, preparatory training began through the in-service training programs. With respect to the faculties of education, Japan has pre-service and in-service teacher training programs today in order to educate teachers for effective implementation of ICT in schools. "Educational Media" is a subject for bachelor course, carried out through "Learning by Doing" method in order to create a communication between teachers and students. The students gain the theory and practical communication in a class from the viewpoints of (1) non-verbal, (2) verbal and (3) media beneficial (Hayashi, 2003).

Salmon's (2002a) vision of future learning illustrates how information technology could transform the educational experience in different ways, highlighting four potential benefits of improved technology. These are the transmission of quality content; support of life-long learning; flexibility of access and improved communication networks.

Recently, the digital revolution has brought dramatic changes to information storage, access, and retrieving processes. The creation of digital libraries has made a

radical impact on the teaching and learning process. Digital libraries facilitate information services for students, anytime and anywhere. This is much needed, especially if active learning styles become more common (Barnard, 1997; Beagle, 2000; Roes, 2001).

Major benefits of digital libraries include storing resources in digital format, which allows online access to users at numerous locations around the globe at any time. Moreover, digital libraries provide various search techniques to access the digitized resources (Wiederhold, 1995).

Usluel, Mumcu, and Demiraslan (2007) explained that in the practice of ICT, the learning process using graphic and design is simple, easy navigation and mostly used word processors together with practice of the Internet to build database and desktop publishing.

Askar & Olkun (2005) and Usluel, Mumcu, and Demiraslan (2007) showed a significant difference in the teachers age, teaching level, period of ICT usage and concluded that there is an integration of ICT through the learning-teaching period.

The obstacles in the classroom through the learning-teaching process in relation to integration that has been mentioned by teachers is excluded from any computers or internet technology and the teachers have not sufficient knowledge to be able to use ICT (Usluel, Mumcu, ve Demiraslan, 2007).

Furthermore, there is no acceptance of the effects of technology usage on academic outcomes to date, although current popular multimedia reports would suggest negative impacts of technology usage among youth (see Young, 2009). This is especially due to the number of some studies examining the educational impacts of technology usage. In addition, limited studies that have examined educational impacts have failed to examine a range of specific types of technology usage or have been limited by measures and/or sampling designs utilized.

However, the recent technologies created and used are difficult for teachers and researchers to capture the effects of these quick changing technologies (Cotten, McCullough, & Adams, in press).

Activities are the most important factor that helps pre-service teachers to understand the varying degrees of interaction. Online activities can be both interactive (email, IM, etc.) and non-interactive (web-surfing). Some suggest that although non-interactive online

activity may be detracted from in-person interactions, other activities may actually strengthen or substitute face-to-face social connections (Kraut, Mukhopadhyay, Szczypula, Kiesler, & Scherlis, 1999; Weiser, 2001; Zhao, 2006). Those who use the Internet primarily for non-interactive purposes also tend to have fewer in-person social ties (Zhao, 2006). In contrast, those who frequent interactive sites tend to maintain strong interpersonal (in-person) connections (Zhao, 2006). However, different interactive sites reflect varying degrees of interaction. Specifically, "email users tend to communicate online with people whom they also contact offline," whereas, "chat users tend to communicate with some of their social contacts exclusively online" (Paragraph 41).

Objectives

- To investigate the impact of E-Learning on learners' learning
- To identify the impact of ICT on learners' learning
- To encourage faculties members to develop their skills of using E-Learning Tools in higher education

Methodology

Methodology provides a flexible framework to select materials and participants, define criteria, measures and implement evaluation techniques. By adapting these different techniques, the proposed structure model aims to measure the learning for higher education. It consists of e-learning and information communication technology (ICT) attributes. FIG. 1 illustrates this model bellow.

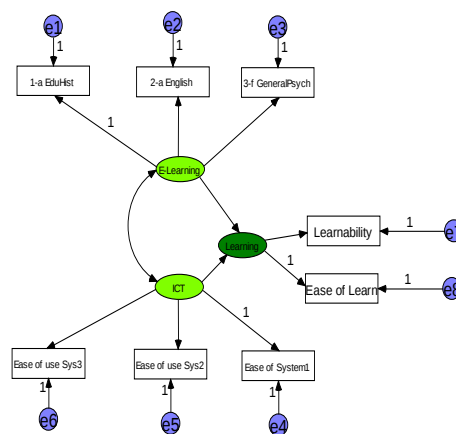


FIG. 1 RESEARCH MODEL

Participants:

A total of 200 undergraduates (pre-service teachers) in English Language Teaching Department in Taiz University have been interested in the learning and using of Internet and digital library web sites.

All of them had enough knowledge of Internet and have used and searched Internet before this study. However, they had no idea of using digital libraries web sites, so they were trained for about two months to use Berkeley Digital Library (BDL) web site correctly for browsing, searching, using different multimedia software, looking for important information etc.

Data Collection:

Berkeley Digital Library (BDL) Web Site was used as a sample in this study, which included online teaching (multimedia), Journals, and Magazines.

Selection of Task:

Different tasks were assigned to participants, such as searching (videos, audios, papers, and e-books), copying (PDF papers or e-books), downloading (audios or videos), watching (academic videos), writing (abbreviation of them in five lines for each), and listening (to some academic audios and its writing abbreviation in five lines for each). Thus, they were asked to watch a video, listen to an audio, and read a text at times in the Internet laboratories (Al-Saeed Library).

The Tool (Questionnaire):

In order to collect data, the following tools were used.

- Questionnaire on digital library developed by the investigators consisted of three parts. Part 1 included questions on Web-based experience (Internet) with twelve (12) questions; while the second part (containing questions on ICT) consisted of ten (10) questions. The third part consisted of fifteen (15) questions seeking learners' comments and opinions and concentrated on the e-learning.
- Interview conducted by the investigator was respect to three questions, seeking information about learners' need, learning activities available and the importance of the digital library in learning English language.

At the end of their allotted training timeframe, the participants were asked to complete their

questionnaires (see instruments section below). ICT was measured by ease of use of the system. E-learning was measured via searching (videos, audios, papers, and e-books), copying (PDF papers or e-books), downloading (audios or videos), watching some academic videos and listening some academic audios.

Research Model and Hypotheses:

H1: E-Learning has a positive effect on learners' Learning

H2: ICT has a positive effect on learners' Learning

Instruments:

Twelve and fifteen questions were concerning the experience of different subjects in the categories of using the Internet ($\alpha=0.899$), and e-learning ($\alpha=0.833$), respectively. Ten questions were based on the use of ICT ($\alpha=0.906$).

A confirmatory factor analysis (CFA) was performed to specify the structure between observed indicators and latent constructs, and test the validity of measurement model. Subsequently, structural equations among latent constructs were examined to test the conceptual structural equation model (SEM). The CFA and SEM procedures were conducted utilizing AMOS 5.0 software.

AMOS, an easy-to-use software package intended for structural equation modelling, the abbreviation of Analysis of Moment Structures. It is a product of Smallwaters, Inc. that provides researchers with powerful and easy-to-use structural equation modelling (SEM) software. Researchers can create more realistic models compared to the case in which standard multivariate statistics or multiple regression models alone are utilized. Using AMOS, researchers specify, estimate, assess, and present their model in an intuitive path diagram to show hypothesized relationships among variables, and then they can assess their models' fit, make any modifications, and print out a publication-quality graphic of their final model.

Data Analysis and Result

The students' experience of using Internet is mentioned in the TABLE 1 below.

The online collaborative is one of the tasks the students perform to in their class short curriculum with the help of their teachers. Therefore, one of the

multi-tasks that the participants were asked to connect to BDL in academic multimedia part is to watch General Psychology Video lecture and perform some tasks at the same time such as downloading, watching and listening, and writing a brief note of it. Then they were asked to open the chat room and discuss with their classmates about the notes, and search the BDL web site or others such as Google, Gigabeia, etc. to collect the important terms of their new curriculum and report the results to their teachers. Hence, the participants were free for chatting during the moment, in private chat room, or just cross talking within the same chat room. The result of this working was that 25% of the participants failed to complete the full tasks whereas the rest succeeded.

TABLE 1 STUDENTS' EXPERIENCE

Experience1	
Internet experience	70% (140 participants)
no Internet experience	30% (60 participants)
using Internet in a week	only=5%, 2 times=15%, 3 times=20%, more than three times=30%, and never=30%
Particular day for browsing the Internet	Friday=50%, Sunday=30%, and Thursday=20%
Searching most of the information from the Web Site	yes=59%, no=41%
Attached to Internet Specific Journals	yes=30%, no=70%
Specific Magazines	yes=50%, no=50%
Specific Digital Libraries	yes=40%, no=60%
Specific Web-site	yes=43%, no=57%
Experience2	
Availability of information under one site	yes=55%, no=45%
Availability of information in short time	yes=55%, no=45%
Getting Multimedia	yes=30%, no=70%
Searching & browsing	yes=90%, no=10%
using help facilities	yes=40%, no=60%

This study first undertook the CFA to confirm the factor loadings of the two constructs (i.e., information and communication technology (ICT) and e-learning) and to assess the model fit. The model was assessed by the fit indices as indicated by Hair, et al. (1998), and Joˆreskog and Soˆrbom (1996).

Convergent validity of CFA results should be supported by average variance extracted, item reliability, and construct reliability Hair, et al. (1998).

As presented in TABLE 1, t-values for all the standardized factor loadings of items are significant ($p < 0.01$). Construct reliability estimates range from 0.71 to 0.97, which indicates a satisfactory estimation. The

average variances extracted (AVE) of all constructs range between 0.537 and 0.909, which exceeds the suggested value of 0.5. The results indicate that the measurement model has good convergent validity. Therefore, the proposed measurement model is reliable and meaningful to test the structural relationships among the constructs.

TABLE 2 CONVERGENT VALIDITY

Items	E-Learning	ICT	Learning	Item Reliability		Delta
1-a EngHis	0.683			0.466		0.534
2-a English	0.879			0.773		0.227
3-f GeneralPsych	0.714			0.509		0.491
					1.748	
Ease of System1		0.917		0.841		0.159
Ease of use Sys2		0.953		0.908		0.092
Ease of use Sys3		0.990		0.980		0.020
					2.729	
Learnability			0.606	0.367		0.633
Ease of Learn			0.884	0.707		0.293
					1.074	
AVE	0.5827	0.9097	0.537			
Variance Extracted	58.27	90.97	53.7			
Construct Reliability (CR)	0.81	0.97	0.71			

The structural model has been estimated with a maximum likelihood estimation method. The fit indices of the structural model are summarized in TABLE 2. The overall model indicates that $\chi^2=18.465$, $df=11$ is significant at $p=0.071$ greater than 0.05. It is indicated that the p-value should be larger than 0.05, i.e. statistically insignificant, the model well fits the empirical data. Furthermore, the χ^2 value is very sensitive to sample size; however, it results in an accepted well-fitted model when sample size increases. In practice, the normal χ^2 (i.e. χ^2/df) has been recommended as a better goodness of fit than the value. In order to examine the model fit, this study uses sample size dependent measures of goodness of fit. The χ^2/df ratio less than 5 is used as the common decision rule of an acceptable overall model fit. The normal χ^2 of model is 1.679 (i.e. $18.465/11$), indicating an acceptable fit. Other indicators of goodness of fit are as follows: CFI=0.977, RMSEA=0.050, GFI=0.912, AGFI=0.811, NFI=0.947, IFI=0.978 and RMR=0.004 (TABLE 3).

TABLE 3 GOODNESS OF FIT

Goodness-of-Fit	CMIN/DF<3.0	P	RMR<0.09	GFI>0.90
	1.679	0.071	0.004	0.912
AGFI>0.80	IFI>0.90	CFI>0.90	RMSEA<0.08	NFI>0.90
0.811	0.978	0.977	0.050	0.947

Note. df, degrees of freedom; CFI, comparative fit index; RMSEA, root mean square error of approximation; RMR, root mean square residual; GFI, goodness-of-fit; AGFI, adjusted goodness-of-fit; NFI, normed fit index; IFI, incremental fit index; CMIN/DF, the minimum discrepancy divided by its degrees of freedom; P, the probability of getting as large a discrepancy.

FIG. 2 presents details regarding the parameter estimates for the model. Totally, the hypotheses are supported. E-learning has significant effect on learning ($\gamma=0.45$, $t\text{-value}=0.516$) and ICT significantly affects learning ($\gamma=0.19$, $t\text{-value}=1.545$).

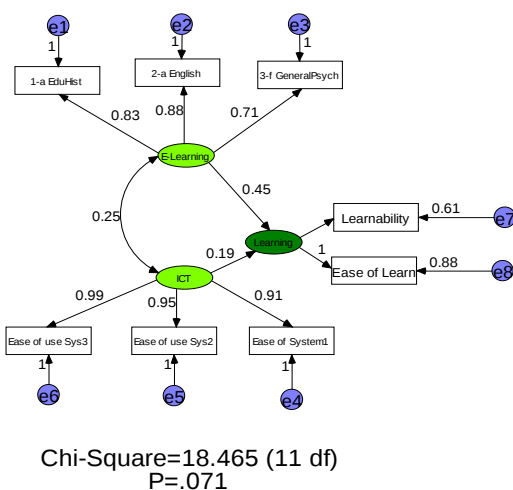


FIG. 2 STANDARDIZED RESEARCH MODEL

Discussion and Conclusion

This study tends to identify the e-learning and ICT diffusion in universities by English language teaching students (pre-service teachers). The findings of the study show that the use of e-learning and ICT techniques is getting more widespread in higher education; and the students make use of them mostly as a means of educational technology and communication and to do research about the Internet.

This study has investigated the underlying relationships between e-learning and ICT which support online teaching for higher education. All hypotheses postulated by the structural models are supported. As a result, the e-learning with associated activities has a strong positive effect on the learning in higher education. Having its stronger impact on reading, listening, and watching activities, it is emphasized that e-learning is required in Universities particularly for receiving knowledge through

multimedia in academics and research. Using the Internet connection of many Journals and Magazines encourages faculty members of higher education and researchers to interact with ICT and e-learning. Therefore, it is significant that multimedia as a technique or a tool of the e-learning and ICT should be more widespread, and faculty members in higher education should be supported with technical and technological equipments and the process should be institutionalized via the policies and strategies of Universities.

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